

FRANTSEVICH, I.N., MOCHARNYUK, R.F.

Investigating the kinetics of high-temperature oxidation of iron-copper alloys. Vop. por. met. i prochn. mat. no.8:69-74 '60.

(MIRA 13:8)

(Iron-copper alloys--Corrosion)

(Metals at high temperatures)

FRANTSEVICH, I.N., MOCHARNYUK, R.F.

Investigating the kinetics of high temperature oxidation of  
Fe-Cu-Ti alloys. Vop. por. met. i prochn. mat. no.8:75-80  
'60. (MIRA 13:8)

(Iron-copper-titanium alloys--Corrosion)  
(Metals at high temperature)

80218

S/126/60/009/04/021/033  
E021/E435

18.6100

AUTHORS:

Frantsevich, I.N., Shiyanovskaya, I.Ye. and  
Lavrenko, V.A.

TITLE:

Cold-working and Recovery of Tungsten and Molybdenum  
of High Purity Under Conditions of an Inhomogeneous  
Stressed State

PERIODICAL:

Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 4,  
pp 593-597 (USSR)

ABSTRACT:

Compacted cermet materials of high purity were used in the investigation. Cylindrical specimens of tungsten of a purity 99.989% and a density 19.3 g/cm<sup>3</sup>, and molybdenum of a purity of 99.988% and density 10.2 g/cm<sup>3</sup>, were subjected to a pressure of 300 kg/mm<sup>2</sup> under a 100-ton press. Deformation produced was 40% for tungsten and 55% for molybdenum. The cold worked specimens were heat treated in the range 800 to 1650°C for tungsten and 800 to 1200°C for molybdenum for 2 hours in vacuo. The temperature of the start of recrystallization was determined by Rockwell hardness determinations. A curve of HRC hardness against temperature is shown in Fig 1 (for tungsten). A similar curve of HRA against

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Cold-working and Recovery of Tungsten and Molybdenum of High Purity  
Under Conditions of an Inhomogeneous Stressed State

temperature for molybdenum is shown in Fig 2. The temperatures of recrystallization were 1350°C for tungsten and 1000°C for molybdenum. X-ray analysis of the samples was carried out. By harmonic analysis of the results, it is shown that the broadening of the lines was caused only by microdistortion of the lattice. Fig 4 shows a curve of the recovery of molybdenum by plotting temperature on the abscissa and relative deformation on the ordinate. The curve shows a sharp fall in the microdistortions in the region of recrystallization. Fig 6 shows a similar curve for tungsten. There is a less sharp fall in microdistortions in the region of recrystallization in this case. There are 6 figures and 6 references, 4 of which are Soviet and 2 English.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR  
(Institute of Cermets and Special Alloys AS UkrSSR)

SUBMITTED: June 29, 1959

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81902

18.1250

S/126/60/010/01/004/019

E111/E335

AUTHORS: Kalinovich, D.F., Kovenskiy, I.I., Smolin, M.D. and  
Frantsevich, I.N.

TITLE: Mobility of Chromium Atoms in a Nickel-chromium Alloy  
Under the Action of a Direct Electric Field

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10,  
No. 1, pp 42 - 46

TEXT: The authors point out that the study of migration of ions in alloys can give indications of the high-temperature stabilizing role of alloying elements. They describe their work on the migration of chromium in a 0.63 diameter, 60 mm long wire containing 4.36% by weight. The central part of the specimens was electrolytically coated with a 5-micron thick layer of

<sup>51</sup>Cr. After annealing at 1200 °C for 60 hours, the specimens were electrolytically etched to remove the surface layer. Longitudinal radioactivity distribution was measured with an MST-17 counter. Specimens were then placed in an argon atmosphere and a direct current passed through them. Activity-versus-position plots before and after passage of current at 1000 °C for 120 hours (Fig1) and for 950, 1000, 1050 and 1100 °C  
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81902

S/126/60/010/01/004/019  
E/11/555

Mobility of Chromium Atoms in a Nickel-chromium Alloy Under the  
Action of a Direct Electric Field

showed appreciable migration of chromium towards the cathode. Allowing for diffusion the authors calculate the speed of migration of chromium (average values rise from  $2.70 \times 10^{-8}$  at 950 to  $29.71 \times 10^{-8}$  cm/sec at 1100 °C). By removing the outer layer of treated specimens and repeating the activity measurements (Figure 2), migration within the specimen was found to be less than near the surface ( $7.20 \times 10^{-9}$  -  $1.55 \times 10^{-8}$  cm/sec). For both there was a linear relation between the average displacement of the chromized-zone boundary and duration of experiment. Using Einstein's equation (Ref.4) the authors calculate effective chromium-ion charge values in solid solution in nickel to be 57.6, 42.5, 34.7 and 27.6 at 950, 1000, 1050 and 1100 °C, respectively, which is in line with Wever's values for higher temperatures (Ref.6). There are 2 figures, 2 tables and 6 references: 2 Soviet, 2 English and 2 German.

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<sup>81902</sup>  
S/126/60/010/01/004/019  
E111/E335

Mobility of Chromium Atoms in a Nickel-chromium Alloy Under the  
Action of a Direct Electric Field

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov  
AN USSR (Institute of Cermets and Special Alloys  
of the Ac.Sc. Ukrainian SSR)

SUBMITTED: January 16, 1960

Card 3/3

18.1200

S/126/60/010/006/010/022  
E193/E483

AUTHORS: Erantsevich, I.N. and Voytovich, R.F.  
TITLE: High-Temperature Oxidation of Refractory Alloys.  
I. The Tungsten-Titanium Alloys  
PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.6,  
pp.857-861

TEXT: The object of the investigation, described in the present paper, was to study the kinetics of oxidation of titanium and tungsten-titanium alloys, containing 15, 50 and 75% titanium, at 500, 600, 700, 800 and 900°C. The rate of oxidation of argon-arc melted specimens, homogenized by 35 h vacuum-annealing, was determined by the conventional gravimetric method. The results indicated that whereas small additions of tungsten improve the oxidation resistance of titanium at temperatures up to 700°C, the rate of oxidation of tungsten increases sharply as a result of small additions of titanium. The temperature-dependence of the rate of oxidation of the alloys studied is described by  $K = A \exp(-B/RT)$ , the values of A and B being tabulated below. X

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E193/E483

High-Temperature Oxidation of Refractory Alloys. I. The Tungsten-Titanium Alloys

Comp. wt %	A	B	Temperature Range °C
W - Ti (15%)	7.39	31800	500 - 1000
	$1.29 \times 10^{-4}$	29800	500 - 700
	$1.04 \times 10^{-2}$	49000	700 - 900
W - Ti (50%)	$2.76 \times 10^{-5}$	23800	500 - 700
	$6.76 \times 10^{-3}$	59600	700 - 900
	$3.74 \times 10^{-6}$	19900	500 - 700
W - Ti (75%)	$1.51 \times 10^{-4}$	14900	700 - 900

The results are discussed in the frame of the concepts formulated by Hauffe and Pfeiffer (Ref. 8 and 9). Part II of this study relates to tungsten-zirconium alloys; it is published on pp.682-685 of the same issue. There are 8 figures, 1 table and Card 2/3

S/126/60/010/006/010/022  
E193/E483

High-Temperature Oxidation of Refractory Alloys. I. The Tungsten-Titanium Alloys

10 references: 2 Soviet and 8 non-Soviet.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov  
AN UkrSSR (Institute of Cermets and Special  
Alloys AS UkrSSR)

SUBMITTED: April 28, 1960

Card 3/3

SAMSONOV, Grigoriy Valentinovich; PADERNO, Yuriy Borisovich; FRANTSEVICH, I.N., otv. red.; KISINA, I.V., red. izd-va; LIBERMAN, T.R., tekhn. red.

[Rare-earth metal borides] Boridy redkozemel'nykh metallov. Kiev, Izd-vo Akad. nauk USSR, 1961. 92 p. (MIRA 14:8)

1. Chlen-korrespondent AN USSR (for Frantsevich)  
(Rare earth borides)

PISARENKO, Georgiy Stepanovich [Pysarenko, H.S.]; TROSHCHENKO, Valeriy Trofimovich; FRANTSEVICH, I.M. [Frantsevykh, I.M.], akademik, otv. red.; REZHENNIK, T.K., red.izd-va; LIBERMAN, T.R., tekhn. red.

[Statistical theory of strength and its application to ceramic metal materials] Statystychni teorii mitsnosti ta ikh zastosuvannia do metalokeramichnykh materialiv. Kyiv, Vyd-vo Akad. nauk URSR, 1961. 104 p. (MIRA 15:3)

1. Akademiya nauk USSR (for Frantsevich).  
(Ceramic metals) (Strength of materials)

SAMSONOV, Grigoriy Valentinovich; VEREYKINA, Lyudmila Leonidovna;  
FRANTSEVICH, I.N., otv. red.; KISINA, I.V., red. izd-va;  
YEFIMOVA, M.I., tekhn. red.

[Phosphides] Fosfidy. Kiev, Izd-vo Akad. nauk USSR, 1961. 126 p.  
(MIRA 14:9)

1. Chlen-korrespondent AN USSR (for Frantsevich).  
(Phosphides)

PHASE I BOOK EXPLOITATION SOV/6032

Yeremenko, V. N., Resp. Ed.; I. N. Frantsevich, G. V. Samsonov,  
I. M. Fedorchenko, G. S. Pisarenko, V. V. Grigor'yeva, and  
V. I. Nizhenko, eds.

Poverkhnostnyye yavleniya v metallakh i splavakh i ikh rol' v  
protsessakh poroshkovoy metallurgii (Surface Phenomena in  
Metals and Alloys and Their Role in Powder-Metallurgy Processes)  
Kiyev, Izd-vo AN USSR, 1961. 213 p. 1710 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR. Institut metal-  
lokeramiki i spetsial'nykh splavov.

Ed. of Publishing House: Z. S. Pokrovskaya; Tech. Ed.: A. M. Lisovets.

PURPOSE: This collection of articles is intended for scientific  
research workers, engineers specializing in metals, and metal-  
lurgists. It may also be useful to advanced students at schools  
of higher education.

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Surface Phenomena in Metals (Cont.)

SOV/6032

COVERAGE: Articles of this collection discuss the role of surface phenomena in powder metallurgy processes and in processes of the strong bonding of various substances. Theoretical calculations of the surface tension of some carbides and nitrides are presented. The book also reviews modern methods for studying the surface properties of metals at high temperatures and presents data on the surface tension of refractory metals and of binary metal systems. Particular attention is given to the effect of various additions on the surface tension of metals and on the interphase tension at the boundary between metals and various refractory compounds. Data on the effect of thin metal coatings on the structural and mechanical properties of metals are also presented. No personalities are mentioned. Each article is accompanied by references, mostly Soviet.

TABLE OF CONTENTS:

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SAMSONOV, Grigoriy Valentinovich; PORTNOY, Kim Isayevich; FRANTSEVICH, I.N.,  
retsenzent; SKLYAROV, N.M., doktor tekhn. nauk, prof., retsenzent;  
BAL'SHIN, M.Yu., kand. tekhn. nauk, retsenzent; BOCHVAR, M.A., inzh.,  
red.; VINOGRADSKAYA, S.I., red. izd-va; ROZHIN, V.P., tekhn. red.

[Alloys made of high-melting compounds] Splavy na osnove tugoplav-  
kikh soedinenii. Moskva, Gos. nauchno-tekhn. izd-vo Oborongiz,  
1961. 303 p. (MIRA 14:9)

1. Chlen-korrespondent AN USSR (for Frantsevich).  
(Heat-resistant alloys) (Ceramic metals)



S/137/62/000/004/038/201  
A006/A101

15.2240

AUTHORS: Lyashchenko, A. B., Mel'nichuk, P. I., Frantsevich, I. N.

TITLE: The normal modulus of elasticity of some refractory compounds

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 39, abstract 4G256  
("Poroshk. metallurgiya", 1961, no. 5, 10 - 19, English summary)

TEXT: The dynamical method was used to measure E of a number of refractory compounds ( $\text{MoSi}_2$ ,  $\text{Mo}_3\text{Si}$ ,  $\text{ZrSi}_2$ ,  $\text{TiSi}_2$ , VC, TiC,  $\text{TiB}_2$ ,  $\text{W}_2\text{C}$ ). E was measured on specimens of different porosity and these data were extrapolated to zero porosity. An empirical formula is proposed, describing the effect of porosity on E. The method is described of manufacturing the specimens. The temperature dependence of E is determined for TiC and  $\text{Mo}_3\text{Si}$  at up to  $1,000^\circ\text{C}$ . The values of the thermal coefficient of E, the mean square displacements of atoms, and characteristic temperatures are evaluated. The nature of these quantities is discussed. There are 12 references.

R. Andriyevskiy

[Abstracter's note: Complete translation]

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S/021/61/000/005/011/012  
D215/D304

AUTHORS: Frantzevych, I.N., Corresponding Member of AS UkrSSR,  
and Kovens'kyi, I.I.

TITLE: Investigating electrotransport in some alloys with  
high electric resistance

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 5,  
1961, 636 - 639

TEXT: The paper is concerned with the investigation of electro-  
transport of iron and chromium in the alloys Fe-Cr and Fe-Cr-Al,  
also with that of iron, chromium and nickel in the alloy Fe-Cr-Ni.  
In the experiments radioactive isotopes Fe<sup>55</sup>, Cr <sup>51</sup> and Ni<sup>63</sup> were  
used, on samples in the form of wires approx. 0.6 mm thick and 70  
mm long. The methods of the experiments have been described (Ref.  
4: D.F. Kalinovich, I.I. Kovenskiy, M.D. Smolin, I.N. Frantzevich,  
Fizika metal. i metalloved, 10, 42, 1960). A thin and narrow layer  
of the radioisotope of the element was brought onto the central

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part of the sample with the aid of electrolysis. The samples were heated by direct current and the direction and velocity of electrotransport was studied by observing the displacement of the radioactive zone. To obtain more accurate data, diffusion coefficients were measured on the same samples according to methods described in M.D. Glinchuk, D.F. Kalinovich, I.I. Kovenskiy, M.D. Smolin (Ref. 5: Inzh. fiz. zhurn., 8, 78, 1960). Results are given in tabulated form. The magnitude of the effective charge of ions does not vary with temperature within the limits of experimental error while investigation of other substances has shown that  $Z^-$  diminishes when  $T$  increases. For the temperatures interval of this experiment one can put, with great accuracy,  $\rho = \rho_0 + T$ ,  $\rho$  being the electric resistance. On the other hand it is known that  $\lambda = \lambda_1 + \lambda_2 = (1/\rho_1) + (1/\rho_2) = 1/\rho$ ,  $\lambda$  being the conductivity (the indices 1 and 2 refer to electrons and holes respectively), i.e.

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$$\frac{1}{\alpha} \cdot \frac{1}{T + \frac{\rho_0}{\alpha}} = \frac{1}{\alpha_1} \cdot \frac{1}{T + \frac{\rho_{01}}{\alpha_1}} + \frac{1}{\alpha_2} \cdot \frac{1}{T + \frac{\rho_{02}}{\alpha_2}} \quad (3)$$

Here  $\rho_{01}$ ,  $\rho_{02}$  and  $\alpha_2$  have the same physical meaning as  $\rho_0$  and  $\alpha$  but they take into account the electron and hole conductivity. In a special case  $\rho_0/\alpha = \rho_{01}/\alpha = \rho_{02}/\alpha$ , i.e. when  $\rho_{01}/\rho_{02} = \text{const.}$  in the temperature interval investigated, the function  $Z^* = f(1/(T + \rho_0/\alpha))$  is, according to M.D. Smolin, I.N. Frantzevich (Ref. 7: DAN SSSR, 136, 82, 1961) a straight line. Using the formula  $\lambda =$

$= 8\pi^{-1/3} (e^2/h) \ln^{2/3}$  [Abstractor's note:  $\pi$  appears to be a misprint],  $h$  being Planck's constant, the authors of (Ref. 7: Op.cit.) obtained in this case

$$Z^* = z - 1,273 \cdot 10^4 n_1^{1/3} \sigma_1 \frac{1}{\alpha_1} \frac{1}{T + \frac{\rho_0}{\alpha}} + 1,273 \cdot 10^4 n_2^{1/3} \sigma_2 \left( \frac{1}{\alpha} - \frac{1}{\alpha_1} \right). \quad (4)$$

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$$\cdot \frac{1}{T + \frac{\rho_0}{\alpha}} \cdot \quad (4)$$

The quantities  $z$ ,  $n_1$ ,  $\sigma_1$ ,  $n_2$ ,  $\sigma_2$  can be considered constant within the temperature interval of the experiments described here; therefore (4) becomes

$$z^* = z + K \cdot \frac{1}{T + \frac{\rho_0}{\alpha}} = z + z', \quad (5)$$

where  $K = 1,273 \cdot 10^4 n_2^{1/3} \sigma_2 (\frac{1}{\alpha} - \frac{1}{\alpha_1}) - 1,273 \cdot 10^4 n_1^{1/3} \sigma_1 \frac{1}{\alpha_1}$  is a constant. If  $\alpha$  is very small the condition  $\rho_{01}/\rho_{02} = \text{const}$  will be realized with sufficient accuracy, and since  $\alpha$  is small for the alloys treated here the effective charges of the components of these must satisfy the equation (5). From the fact  $z \neq f(T)$  it

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follows that the result  $Z^* = \text{const}$  could be obtained only in two cases: 1) if  $z' = \text{const} \neq 0$ ; 2) if  $z' = 0$ . The first case is impossible since the expression for  $z'$  contains the variable  $T$ . In the second case it is necessary that  $K$  be equal to 0. This is again possible in two cases: 1) if the two terms of which  $K$  consists are equal, 2) if they are both nearly equal to 0. The first condition means that the interactions of electrons and holes with the ions are equal in magnitude, which can be written

$$\frac{n_1^{1/3} \sigma_1}{n_2^{1/3} \sigma_2} = \frac{\alpha_1}{\alpha_2} - 1 \quad (6)$$

or in a two-component system

$$\frac{\sigma_1'}{\sigma_2'} = \frac{\sigma_1''}{\sigma_2''} \quad (7)$$

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(' refers to the first and " to the second component). For a three-component alloy one must add the ratio  $\sigma_1''/\sigma_2''$  in (7). It follows that equal magnitude of the terms in  $z'$  is generally possible but has very small probability. The case of both terms being nearly equal to 0 is much more probable. It can be expected in alloys with small concentrations and mobilities of the carriers of current and small temperature coefficient of the electric resistance. The investigations described here confirm this, as the alloys studied satisfy these conditions. If  $K$  is nearly equal to 0, i.e.  $Z^*$  does not vary with temperature, one can assume  $Z^* = z$  within the limit of experimental error. It follows that magnitudes of ion charges were obtained. There are 1 table and 7 references: 5 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: K. Compagnon, G. Haven, Trans. Faraday Soc. 52, 786, 1956; H. Wever, Proc. Symp. No. 9, Phys. Chem. 2L, 2, 1958.

ASSOCIATION: Instytut metalokeramiki i spetsialnykh splaviv AN  
URSR (Institute of Metallogeramics and Special Alloys  
AS UkrSSR).

SUBMITTED: January 19, 1961  
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25349

S/021/61/000/007/006/011  
D205/D306

24,7700

AUTHORS: Frantsevych, I.M., Member of ASUkrRSR, and Smolin, M.D.

TITLE: Dependence of electrotransportation of the components of Ni-Cr alloy on concentration

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR, Dopovidi, no. 7, 1961, 908 - 910

TEXT: An ion which is migrating in the process of electrotransport is influenced, apart from the force of a constant electric field, also by the resultant force of interaction between the ion and the conductivity electrons and holes. The charge of the ion calculated according to Einstein's formula (Ref. 1: Ann. d. Phys., 17, 549, 1905) on the basis of experimental data is therefore not its true charge but some effective one. The theory gives for the latter

$$z^* = z - n_{\sigma_-} l_- + n_{\sigma_+} l_+, \quad (1)$$

z being the true charge of the ion,  $n_{\sigma_-} l_-$  and  $n_{\sigma_+} l_+$  the concen-  
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tration, scattering cross section, mean free path of the electrons and the holes respectively. To transform (1), one can use

$$\lambda = \left( \frac{8\pi}{3} \right)^{1/3} \frac{e^2}{h} \ln^{1/2}, \quad (2)$$

which is deduced in approximate two-band theory of metals. In (2)  $\lambda$  is electrical conductivity,  $l$  and  $n$  - mean free path and concentration of current carriers,  $e$  the elementary charge,  $h$  - Planck's constant. From (1) and (2) substituting the values of the constants and taking into account  $\lambda = \lambda_+ + \lambda_-$  one gets

$$z^* = z - 1,3 \cdot 10^4 n_-^{1/3} \sigma_- \lambda_- + 1,3 \cdot 10^4 n_+^{1/3} \sigma_+ (\lambda - \lambda_-) \quad (3)$$

( $\lambda_+$  is hole conductivity and  $\lambda_-$  electron conductivity). Experimental determination of  $z$ ,  $\sigma_+$  and  $\sigma_-$  is particularly complicated. In the present paper the authors try to determine  $z$ ,  $n_-$ ,  $n_+$  etc. from

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the data of temperature dependence ( $c = \text{const}$ ) and temperature dependence ( $T = \text{const}$ ) of electrotransportation in the approximation given by the theory of electro-transportation and the two-band theory of metals. The authors investigated the concentration dependence of electrotransportation in the alloys Ni-Cr with the following concentrations of Cr: 4.76, 7.56, 10.28, 15.49, 19.66, 22.12, 25.07, 31.01 (atomic %) at 1250°C. The experimental methods are described in D.F. Kalinovich, I.I. Kovenskiy, M.D. Smolin, and I.N. Frantsevich (Ref. 5: Izv. AN SSR, OTN, metallurgiya i toplivo, 1, 71, 1959). To increase accuracy all necessary quantities were determined experimentally for each specimen. Two specimens were investigated for each concentration. Radioactive isotopes  $\text{Cr}^{51}$  and  $\text{Ni}^{63}$  were used as indicators. In the concentration interval 4.76 - 19.66 at percent Cr where the dependence of  $\rho'$  on  $c(1 - c)$  is linear the following equations are valid

$$z_{\text{Cr}} = 0,18 \left[ \frac{1}{c(1-c) + 0,011} \right]^2 - 1,7 \left[ \frac{1}{c(1-c) + 0,011} \right] + 13,0; \quad (6)$$

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$$z_{Ni} = -0,13 \left[ \frac{1}{c(1-c) + 0,011} \right] - 1,0 \left[ \frac{1}{c(1-c) + 0,011} \right] - 11,4. \quad (7)$$

These have been obtained by adjusting and the parameters determined with the aid of the method of averages. Since temperature dependence was not investigated the calculation of  $z$ ,  $\sigma_-$ ,  $\sigma_+$  was approximate, with the assumption that these do not depend on the concentration in the interval 4.76 - 19.66 at percent Cr. Values of  $n_-$ ,  $n_+$  and the mobilities  $\mu_-$ ,  $\mu_+$  were taken from H. Schmidt (Ref. 6: Z.F. Metallkunde, 49, 3, 113, 1958). All results are given in the Table. There are 1 table and 6 references: 4 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION: Instytut metalokeramiky i spetsial'nykh splaviv AN  
URSR (Institute of Metalloceramics and Special Alloys  
AS UkrRSR)

SUBMITTED: March 23, 1961

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28672

S/021/61/000/009/010/012  
D274/D304

18.8100

AUTHORS: Frantsevykh, I.M., Academician AN USSR, and  
Kovens'kyi, I.I.

TITLE: Investigating the electrical transfer of carbon in  
metals of the iron group

PERIODICAL: Akademiya nauk UkrSSR. Dopovidi. no. 9, 1961,  
1169-1171

TEXT: The temperature dependence of the effective charges  $z$  of  
carbon in its solid solutions FeC, CoC, and NiC are obtained. The  
character of the experimentally obtained temperature dependence  
of  $z^*$  corroborates the theoretical predictions which led to the  
expressions

$$z^* = z - n_1 \sigma_1 l_1 + n_2 \sigma_2 l_2 \quad (1) \checkmark$$

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$$Ax^2 + BxZ^* - Cx - Z^* + z = 0 \quad (3)$$

where  $z$  is the ion charge,  $n_1$ ,  $\sigma_1$ ,  $l_1$  and  $n_2$ ,  $\sigma_2$ ,  $l_2$  are the density, scattering cross-section, and free path of the electrons and holes,  $Z^*$  is an effective charge which can be experimentally determined from electrical transfer by means of Einstein's relationship (and taking into account the correlation factor

$f): Z^*eD = BkTf$ , where  $D$  is the diffusion coefficient at the temperature  $T$  and  $B$  is the ion mobility;  $A$ ,  $B$  and  $C$  are constants related to the conductivity parameters and those of electron- and hole scattering by migrating ions. The temperature interval of the experiments is taken as large as possible and the ion mobility has to be high. These requirements are fulfilled by the investi-

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D274/D304

Investigating the electrical ...

gated solid solutions of carbon in iron, cobalt and nickel. The specimens were wire pieces 70 mm long and 0.6 mm in diameter. The middle part of the specimens was labelled by radioactive isotopes  $C^{14}$ . The temperatures ranged from 600-1400°C. Up to 800°C, the specimens were heated in a furnace; for higher temperatures, a direct current was used. The diffusion coefficient for carbon, as well as the rate of electrical transfer (the transport rate), were measured by means of the radioactivity of the tracer. The obtained values of  $Z^*$  were processed by the method of least squares. Thereupon, the temperature dependences of the effective charge of carbon in its solid solutions FeC, CoC, and NiC were obtained. The parameters of this dependence are listed in a table. In all the alloys, the carbon migrated towards the cathode; as thereby  $Z^*$  exceeded  $z$ , the influence of a "hole wind" on the electrical transfer is established. The ion charge of carbon in austenite was found to be nearly 4 units, thus confirming T.A. Lebedyev's assumption (Ref. 1: Metallurg, 5, 12, 1934). This charge decreases on passing from FeC to CoC and NiC. There are 2 tables and 9

Card 3/4

Investigating the electrical ...  
28692  
S/021/61/000/009/010/012  
D274/D304  
references: 7 Soviet-bloc and 2 non-Soviet-bloc (including one translation). The reference to English-language publications reads as follows: K. Compaan, Y. Haven, Trans. Faraday Soc., 52, 786, 1956.

ASSOCIATION: Instytut metalokeramiky i spetsial'nykh splaviv  
AN USSR (Institute of Powder Metallurgy and Special Alloys AS UkrSSR)

SUBMITTED: April 28, 1961

Card 4/4

FRANTSEVICH, I. M.

21359

S/021/61/000/011/007/011  
D299/D306

AUTHORS: Frantsevykh, I. M., Academician AS UkrRSR, and  
Kovens'kyi, I.I.

TITLE: On the transport of carbon in titanium, tantalum and tungsten

PERIODICAL: Akademiya nauk UkrRSR. Dopovidi, no. 11, 1961,  
1471-1474

TEXT: Electrotransport of carbon in titanium, tantalum and tungsten is investigated (with a carbon content of approximately 0.1 weight %). The radioactive isotope  $C^{14}$  was used. In order to increase the accuracy of calculations, the diffusion coefficient of carbon was determined from the same specimens as were used for studying the electrotransport. The specimens were appr. 70 mm long and had a diameter of appr. 0.6 mm. The middle part of the specimens was labelled with  $C^{14}$ . The specimens were heated by a direct current; thereupon, the distribution of the radioactivity was measured

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On the transport of ...

21359  
S/021/61/000/011/007/011  
D299/D306

at intervals of 0.1 mm. As a result, the carbon distribution in relative units was obtained. From the concentration curve, the diffusion coefficient of carbon was calculated, and from the displacement of the radioactive zone - the rate of electrotransport of the carbon at the various temperatures of the experiment: 950 - 1650°C in titanium, 600 - 2600°C in tantalum, 1800 - 2800°C in tungsten. A table lists the obtained diffusion coefficients and the corresponding activation energies. The experimental results were used for determining the effective charges  $Z^*$ ; thereupon, the method of least squares was used for calculating the parameters of equation

$$Z^* = z + a \frac{1}{T + \frac{p_0}{\alpha}} \quad (3)$$

and

$$Ax^2 + BxZ^* - Cx - Z^* + z = 0 \quad (4)$$

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S/021/61/000/011/007/011  
D299/D306

On the transport of ...

$\alpha$  is the temperature coefficient of the alloy,  $\rho$  is the electrical conductivity, the parameters A, B and C characterize the scattering of electrons and holes by migrating ions, and the temperature dependence of  $\rho$ . It was established that the effective charges of carbon in titanium and tungsten follow a temperature dependence expressed by Eq. (4), whereas the effective charge for tantalum-carbon satisfies a linear equation. For the first 2 alloys, the parameter A in Eq. (4) can be neglected. For all 3 alloys, the electrotransport took place towards the cathode. The magnitude of the effective charges exceeded in all cases  $z$ . A table shows that the carbon charge decreases in the order: Ti-C, W-C. An explanation of this decrease in charge is attempted in terms of the energy of the d-sublevels. There are 2 tables and 9 references: 5 Soviet-bloc and 4 non-Soviet-bloc. The reference to the English-language publication reads as follows: K. Compaan, Y. Haven, Trans. Faraday Soc., 52, 786, 1956. X

ASSOCIATION: Instytut metalokeramiki i spetsial'nykh splaviv AN  
USSR (Institute of Powder Metallurgy and Special

Card 3/4

21359

S/021/61/000/011/007/011

D299/D306

On the transport of ...

Alloys AS UkrRSR)

SUBMITTED: May 24, 1961

x

Card 4/4

SMOLIN, M.D.; FRANTSEVICH, I.N.

Application of the electric transfer method in the study of the  
electronic structure of metals and alloys. Fiz.tver.tela 3  
no.7:2115-2122 J1 '61. (MIRA 14:8)

1. Institut metallokeramiki i spetsial'nykh splavov AN USSR,  
Kiyev.  
(Ions--Migration and velocity) (Metals--Electric properties)

FRANTSEVICH, I. N.

18.1500

1145 1555

22826  
S/170/61/004/005/012/015  
B111/B214

AUTHORS: Kalinovich, D. F., Koverukiy, I. I., Smolin, M. D.,  
Frantsevich, I. N.

TITLE: The diffusion of nickel in a nickel molybdenum alloy in an  
electric field

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 4, no. 5, 1961, 108-110

TEXT: The electric field produces a directed displacement of the atomic  
shell in the crystal lattice of a pure metal and solid solutions. Two  
forces act on the ions: the electric field and a force depending on the  
momentum transition between ions and the conduction electrons or holes. The  
electrotransportation of Ni ions in a solid solution of molybdenum in nickel  
is investigated in this paper (molybdenum content 9.24% by weight). The  
tracer was  $Ni^{63}$  which was measured by a counter of the type T25-BFA (T25-BFI).  
The temperature of the sample was measured by a pyrometer of the type  
ХГМИИП (KhGIMIP). The direction and rate of electrotransportation could be  
determined from the displacement of the boundary of the radioactive zone.  
The diffusion was eliminated by relating the rate of electrotransportation

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22826

S/170/61/CO4/CO5/012/015  
B111/B214

The diffusion ...

to the arithmetic mean of the displacement of the boundary of the active zone. The force acting on an ion may be written as

$$F = Ee(z - n_1\sigma_1l_1 + n_2\sigma_2l_2),$$

where E is the potential; e the electronic charge; z the charge of the ion in multiples of e;  $n_1$  concentration of the conduction electrons;  $\sigma_1$ ... the scattering cross section of the conduction electrons on the migrating ion; and  $l_1$ ... the mean free path of the electrons on the Fermi surface. The index 2 denotes hole conductivity. The quantity  $z - n_1\sigma_1l_1 + n_2\sigma_2l_2 = z^*$  is the effective charge which is equal to the true charge in the absence of the effect of electrons and holes. Applying Einstein's formula one may write for the effective charge  $z^*$ :  $z^* = 300 v \lambda q k T f / I D e$  (2), where v is the rate of electrotransportation;  $\lambda$ , q the electrical conductivity and area of the cross section of the sample;  $f = 0.78$  (for a face centered lattice); I the current strength; and D the diffusion coefficient. The derivation of the diffusion coefficient has been given in IFZh, No. 8, 78, 1960. The value found is  $D = 2.68 \exp(-65600/RT)$ . The experimental conditions, the rates of electrotransportation, and the effective charges

Card 2/3

22626

The diffusion ....

S/170/61/004/005/012/015  
B111/B214

calculated according to (2) are collected in Table 1. All the experiments showed that nickel migrates to the anode. There are 1 table and 10 references: 6 Soviet-bloc and 4 non-Soviet-bloc. The three most recent references to English-language publications read as follows: 1) Compaan, K., Haven G.: Trans. Faraday Soc., 52, 786, 1956; 2) Wever H.: Proc. of Symp. No. 9 of Phys. Chem., 21, 2, 1958.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR'g. Kiev (Institute of Powder Metallurgy and Special Alloys AS UkrSSR, Kiev)

SUBMITTED: September 30, 1960

Legend to Table 1:

1 - Temperature in °C;  
2 - experimental time in hours; 3 - rate of electrotransportation in cm/sec; 4 - effective charge.  
Card 3/3

Температура, °C ①	Время опыта, час ②	Скорость переноса см/сек ③	Эффективный заряд ④
1150	200	$1,36 \cdot 10^{-4}$	25,7
1200	150	$2,22 \cdot 10^{-4}$	20,9
1250	100	$4,18 \cdot 10^{-4}$	18,0
1300	100	$7,36 \cdot 10^{-4}$	15,0

S/137/62/000/007/016/072  
A052/A101

AUTHORS: Teodorovich, O. K., Frantsevich, I. N.

TITLE: Role of diffusion processes in the formation of powdered-metal  
iron-copper alloy

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 7, 1962, 45, abstract 70312  
("Poroshk. metallurgiya", no. 6, 1961, 35 - 43; English summary)

TEXT: A microscopic study of heterodiffusion in the system Cu-Fe and  
(Fe-Cu) - (Cu-Fe) has shown that the structure of interphase boundaries is im-  
perfect as a result of heterodiffusion processes when pure Fe and Cu are used.  
The results of the X-ray spectrum analysis of microvolumes have confirmed the  
uniformity of component distribution when intersaturated solid solutions on Cu  
and Fe base are used. It is shown that Fe-Cu compositions made of intersaturated  
components have improved ductility and dynamic strength characteristics. There  
are 8 references.

R. Andriyevskiy

[Abstracter's note: Complete translation]

Card 1/1



LYASHCHENKO, A.B.; MEL'NICHUK, P.I. [deceased]; FRANTSEVICH, I.N.

Normal elasticity modulus of certain high-melting compounds.  
Porosh. met. 1 no.5:10-19 S-0 '61. (MIRA 15:6)

1. Institut metallokeramiki i spetsial'nykh splavov AN USSR.  
(Ceramic metals)  
(Elasticity)

FRANTSEVICH, I.N. [Frantsevykh, I.M.], akademik; KOVENSKIY, I.I.  
[Kovens'kyi, I.I.]

State of carbon in titanium, tantalum, and tungsten. Dop. AN  
URSR no.11:1471-1474 '61. (MIRA 16:7)

1. Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR.
2. AN UkrSSR (for Frantsevich).
  - (Alloys--Electric properties)
  - (Carbon)
  - (Ions--Migration and velocity)

S/020/61/136/001/015/037  
B019/B056

AUTHORS: Smolin, M. D. and Frantsevich, I. N.

TITLE: Investigation of the Temperature Dependence of the Electrophoresis in Alloys on the Basis of High-melting Metals

PERIODICAL: Doklady Akademii nauk SSSR, 1961, Vol. 136, No. 1, pp. 81 - 83

TEXT: In the introduction, the authors give some formulas which were set up within the framework of the development of the electrophoresis theory in recent years. Denotations for the resulting force and the effective charge of a migrating ion are given. Next, a report is given on experiments made with Mo, alloyed with 25 % W, and with W, alloyed with 25 % Mo. The experiments were carried out on specimens of 0.5 mm diameter and 60 mm length. The powder-metallurgical production of the specimens is described, the radioactive isotopes  $\text{Mo}^{99}$  and  $\text{W}^{185}$  being used as traces elements. The experiments were carried out within the temperature range of from 1500 to 2500°C according to the alloy. In all experiments a migration of Mo-ions under the effect of a direct (constant) field to the anode and a migration of the W-ions to the cathode was observed. On the basis of the data ob-

Card 1/4<sub>2</sub>

Investigation of the Temperature Dependence of S/020/61/136/001/015/037  
the Electrophoresis in Alloys on the Basis of B019/B056  
High-melting Metals

tained, the effective charge of a migration ion may be described as  
$$z^* = z + k \left( \frac{1}{T + \rho_0 / \alpha} \right) (4).$$
 T is the absolute temperature,  $\rho_0$  the resistivity,  
and  $\alpha$  the temperature coefficient of the electrical resistance, k is a pro-  
portional factor. Knowing the charge and the atomic concentrations of both  
alloy components the electron concentration in both alloys can be cal-  
culated. The results are given in Table 1. There are 1 figure, 1 table, and ✓  
4 Soviet references.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii  
nauk USSR (Institute of Powder Metallurgy and Special Alloys  
of the Academy of Sciences, UkrSSR)

PRESENTED: July 15, 1960, by G. V. Kurdyumov, Académician

SUBMITTED: July 11, 1960

Card 2/4 ✓

FRANTSEVICH, I.N. AND SHIYANOVSKAYA, I. YE.

"Examination of causes of lattice imperfections of phenium and tungsten and explanation of the mechanism of recrystallization processes applied to theses metals under low and high temperatures."

Paper presented at the Powder Metallurgy Conference,  
Smolenice, Czech. 17-20 Sep 1962

S/849/62/000/000/008/016  
A006/A101

AUTHORS: Frantsevich, I. N., Kalinovich, D. P., Kovenskiy, I. I., Smolin, M. D.

TITLE: On the behavior of components of metallic solid solutions in an electric force field

SOURCE: Vysokotemperaturnyye metallokeramicheskiye materialy. Inst. metalloker. i spets. spl. AN Ukr.SSR, Kiev, Izd-vo AN Ukr.SSR, 1962, 75 - 83

TEXT: The method of electric migration makes it possible to estimate directly the donor-acceptor interaction in metallic solid solutions. Previous studies were directed on the electric migration of the alloying component, without investigating the behavior of the base metal atoms; in a constant electric field the possibility of a donor-acceptor interaction between the atoms of the components was not taken into account. In the present article the authors studied the mutual electric migration of both components of some binary alloys, such as Fe-C, Fe-Cr, Fe-W, Ni-W and Fe-Mo, using the method of radio-active iso-

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S/849/62/000/000/008/016  
A006/A101

On the behavior of components of...

topes. The component under investigation was marked with the corresponding radioactive isotope and introduced into the central section of wire specimens, 0.6 mm in diameter and 60 mm long. The distribution of radioactivity over the specimen length was measured prior to and after electric heating. Activity graphs were plotted to determine the orientation and dislocation of the radioactive zone boundaries during the process of electric migration. It was found that carbon, chromium and tungsten migrated under the effect of the electric field towards the cathode. Molybdenum migrates toward the anode and is, contrary to C, Cr and W, an electron acceptor. The electric migration of Fe in binary solutions of C, Cr and W in iron was found to be directed toward the anode, but only a portion of Fe atoms, proportional to the amount of donor-atoms of the admixture component, participated in the migration. On the basis of experimental data obtained, migration rates of the investigated components were calculated and tabulated (Table). The experiments show that a donor-acceptor interaction exists between the components of the Fe-C, Fe-Cr and Fe-W systems. The donor or acceptor nature of admixture atoms is predetermined by the mutual position of energy levels of incomplete shell electrons of the admixture atom, and the Fermi level of the base electron spectrum. The appearance in the lattice of admixture

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On the behavior of components of...

S/849/62/000/000/008/016  
A006/A101

atoms with excess charge is connected with the deformation of energy bands of conductivity near these atoms, and the formation of a charge of the opposite sign, screening the excess charge of the admixture. This screening charge is partially distributed in the conductivity band, and partially in the band corresponding to the internal incomplete shell of the base atom. The temperature dependence of the electric migration effect is explained by the dispersing effect upon the electrons of the conductivity zone of atoms, which are in a state of thermal oscillation at the crystal lattice points, and also by changes in the degree of the donor-acceptor interaction. It can be assumed that the magnitude of the electric migration effect depends upon the correlation between the external electric field forces and the forces resulting from the transfer by conductivity electrons of oriented pulses to the ions. There are 4 figures and 1 table.

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S/849/62/000/000/008/016

A006/A101

On the behavior of components of...

Table. Migration rates of metal alloy components under the effect of an electric field, in v-cm/sec

Alloy investigated	Migrated element	Experimental temperature in °C						
		850	900	950	1000	1050	1100	1150
Fe - C	C	—	—	$8,06 \cdot 10^{-6}$	$11,67 \cdot 10^{-6}$	$14,44 \cdot 10^{-6}$	$31,39 \cdot 10^{-6}$	$39,14 \cdot 10^{-6}$
Fe - C	Fe	—	$3,41 \cdot 10^{-6}$	$2,51 \cdot 10^{-6}$	$1,39 \cdot 10^{-6}$	$0,57 \cdot 10^{-6}$	0	—
Fe - Cr	Cr	—	—	—	$6,8 \cdot 10^{-7}$	$9,4 \cdot 10^{-7}$	$12,5 \cdot 10^{-7}$	$18,8 \cdot 10^{-7}$
Fe - Cr	Fe	—	$3,00 \cdot 10^{-7}$	$4,01 \cdot 10^{-7}$	$4,87 \cdot 10^{-7}$	$6,26 \cdot 10^{-7}$	$5,35 \cdot 10^{-7}$	$44,4 \cdot 10^{-7}$
Fe - W	W	—	$4,72 \cdot 10^{-7}$	$6,37 \cdot 10^{-7}$	$8,80 \cdot 10^{-7}$	$5,68 \cdot 10^{-7}$	$1,35 \cdot 10^{-7}$	0
Fe - W	Fe	—	$1,25 \cdot 10^{-6}$	$1,67 \cdot 10^{-6}$	$2,44 \cdot 10^{-6}$	$1,50 \cdot 10^{-6}$	$0,32 \cdot 10^{-6}$	0
Ni - W	W	$1,25 \cdot 10^{-7}$	$2,78 \cdot 10^{-7}$	$3,89 \cdot 10^{-7}$	$1,86 \cdot 10^{-7}$	$0,72 \cdot 10^{-7}$	0	—
Fe - Mo	Mo	—	—	$4,40 \cdot 10^{-7}$	$5,63 \cdot 10^{-7}$	$7,23 \cdot 10^{-7}$	$7,78 \cdot 10^{-7}$	—

Card 4/4

FRANTSEVICH, I.N.; GUNCHENKO, A.I.; TUL'CHINSKIY, L.N.

Magnetic properties of manganese ferrites with additions of rare-earth metal oxides. Report no.1. Porosh.met. 2 no.5:55-59 S-0 '62. (MIRA 15:11)

1. Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR.  
(Manganese ferrite--Magnetic properties)  
(Rare earth metals)

AUTHOR: Frantse<sup>✓</sup>wich, I. N.

S/226/62/000/002/002/010  
1003/1203

TITLE: Heat resistance of materials used in modern construction

PERIODICAL: Poroshkovaya metallurgiya, no. 2 1962, 9-26

TEXT: The development of modern technology utilising high voltages, jets and rockets calls for a new study of refractory materials, specifically for use in modern engineering. The author lists factors decisive in imparting heat-resistance to refractory materials: the strength of interatomic bonds; the presence of additives having a precipitation hardening effect or that of strengthening the grain boundaries; the absence of impurities that weaken either the crystalline lattice or the phase boundaries. Calculation of the mean square displacement of atoms in the crystalline lattice of refractory materials, is the sole and insufficiently investigated direct criterion for evaluating the strength of the interatomic bonds in these lattices. This gives a serial arrangement of many metals and chemical compounds according to their suitability to be the main component of heat resistant alloys. The author suggests an evaluation of the heat resistance of refractory compounds on the basis of values of their relaxation capacity. The most popular method of manufacturing refractory metal powders, and the most promising is the method of impregnation of porous powder materials with molten substances. An equation is given for the duration of impregnation depending on the capillarity and viscosity of the impregnation medium and the porosity of the impregnated material:

$$t = \frac{4 \eta l_0^2}{r \delta \cos \Theta}$$

Card 1/2

Heat resistance...

S/226/62/000/002/002/010  
1003/1203

where:  $\eta$  = viscosity coefficient;  $l_0$  = length of the impregnated layer;  $r$  = radius of capillary;  $\theta$  = wetting angle. The principal factors influencing the resistance of refractory metals toward scale formation are also defined. There are 11 figures and 2 tables.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys AS UkrSSR)

SUBMITTED: November 23, 1961

Card 2/2

S/020/62/142/006/012/019  
B104/B108

AUTHORS: Frantsevich, I. N., Academician AS UkrSSR, and  
Shiyanovskaya, I. Ye.

TITLE: Study of the fine structure in deformed rhenium crystals

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 6, 1962, 1291-1293

TEXT: Cold hardening and recovery of very pure rhenium were studied by axial and omnilateral compression in a press and by steel rings, respectively. The recrystallization temperature of uni-axially deformed Re specimens (30 %) is 1200°C. In specimens deformed in steel rings it is much less. The recrystallization temperature was determined from the appearing (204) X-ray diffraction line. The microdeformations of the lattice are little affected by annealing the Re specimens deformed by omnilateral compression at temperatures up to 600°C for 2 hours. The first patterns occur in the blurred diffraction lines when the annealing is done at temperatures of 600°C. The microdeformations of the lattice were determined by harmonic analysis of the profile curve of the diffraction line. The relative deformations thus determined indicated that the

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Study of the fine structure...

S/020/62/142/006/012/019  
B104/B108

broadening of the diffraction lines of specimens deformed in steel rings is caused by microdeformations in the lattice. The microdeformation at 600°C determined from the (101) diffraction line is  $1.0 \cdot 10^{-3}$ , the one determined from the (112) diffraction line is  $1.2 \cdot 10^{-3}$ . In discussing the low recrystallization temperature of the specimens deformed in steel rings the authors point to the fact that in this deformation there is almost no ductile displacement of the Re grains, but that the entire deformation energy is accumulated in lattice disturbances inside the grains. Consequently, the Re can recrystallize by a mechanism devoid of diffusion. Reference is made of B. D. Grozin (Mekhanicheskiye svoystva zakalennoy stali, 1951). There are 4 figures, 2 tables, and 3 Soviet references. ✓

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii nauk USSR (Institute of Powder Metallurgy and Special Alloys of the Academy of Sciences UkrSSR)

SUBMITTED: July 8, 1961

Card 2/2

S/137/62/000/006/096/163  
A160/A101

AUTHORS: Mel'nichuk, P. I., Frantsevich, I. N.

TITLE: An investigation of the modulus of elasticity of alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 6, 1962, 13, abstract 6178  
(In collection: "Vopr. poroshk. metallurgii i prochnosti materialov",  
no. 7, Kiyev, AN USSR, 1959, 33 - 38).

TEXT: An investigation was carried out of the effect of the concentration of W on E of Ni-W alloys. The Ni-W alloys were made from Ni with a purity of 99.99% and from foundry alloy containing 22% W, 17.98% Ni and 0.02% admixture. Used was an electric vacuum furnace with crucibles from Al<sub>2</sub>O<sub>3</sub>. The smelted ingots were annealed in an atmosphere of argon at 1,000°C for 10 hours and were subjected to hot rolling. The samples had a diameter of 6±0.01 mm and a length of 120 mm. Prior to the investigation, the samples were annealed in an atmosphere of argon at 900°C for 1 hour to relieve the workhardening. The E was determined by the dynamic method. An increase of E and a decrease of the root mean square displacements of atoms accompanying an increase of the content of W in

Card 1/2

An investigation of the modulus of elasticity of alloys A160/A101 S/137/62/000/006/095/163

Ni-W alloys, show that W increases the strength of the interatomic bond in the crystalline lattice of Ni. An addition of W to Ni also noticeably increases the hardness of Ni-W alloys. The increase of the hardness is caused by the comminution of grains when adding W and by the deformation of the crystalline lattice of Ni during the dissolving of W atoms. A grain comminution is especially noted in alloys containing 14% W. A further increase of the content of W up to 22% does not essentially change the size of the grain. There are 11 references.

V. Srednogorska

[Abstracter's note: Complete translation]

✓  
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Card 2/2



FRANTSEVICH, I.N. [Frantsevych, I.M.]; KALINOVICH, D.F. [Kalynovych, D.F.];  
KOVENSKIY, I.I. [Kovens'kyi, I.I.]; SMOLIN, M.D.

Studying the diffusion of the components of a molybdenum-  
tungsten alloy over a wide temperature range. Ukr. fiz. zhur.  
§ no.9:1020-1025 S '63. (MIRA 17:8)

1. Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR,  
Kiyev.

FRANTSEVICH, I. N.; TEODOROVICH, O. K.; BOYKO, Ye. B.

"Sintered parts of construction made from iron and copper."

Report presented at the Conference on Powder Metallurgy, Krakow,  
Poland, 19-21 Sept 63.

FRANTSEVICH, I. N.; ZHURAKOVSKIY, Ye. A.; LYASHCHENKO, A. B.

"Elastic properties and differences in the electronic structure of some high melting compounds made by powder metallurgy."

Report presented at the Conference on Powder Metallurgy, Krakow, Poland, 19-21 Sept 63.

AM4008911

BOOK EXPLOITATION

S

Frantsevich, Ivan Nikitich (Doctor of Chemical Sciences); Voytovich, Raisa Fominichna (Candidate of Chemical Sciences); Lavrenko, Vladimir Alekseyevich (Candidate of Chemical Sciences)

High-temperature oxidation of metals and alloys (Vy\*sokotemperaturnoye okisleniye metallov i splavov), Kiev, Gostekhizdat USSR, 1963, 321 p. illus., biblio. 1,000 copies printed.

TOPIC TAGS: metal physics, high temperature oxidation, refractory metals, tungsten, molybdenum, tantalum, rhenium, refractory compounds, oxide coating, cermet coating, halogen medium, diffusion, crystal lattice defect, corrosion

PURPOSE AND COVERAGE: The book examines the theory of high-temperature oxidation of metals and alloys from the viewpoint of modern physics of solids and the chemistry of crystal lattice defects. In addition to a critical presentation of the theoretical concepts, the results of experiments by the authors on the kinetics of scale formation on refractory metals and alloys and the first systematic presentation of the oxidation of materials by gases containing sulphur, halogens, corrosion by flash, oxidation of refractory compounds, and anti-corrosion coatings

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AM4008911

are included in the book. The book is intended for employees of research institutes and plant laboratories; it can also be used by engineers in other fields and by students in higher educational institutions.

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2. Oxidation of molybdenum

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AM4008911

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SUB CODE: ML

SUBMITTED: 27 Mar 63

NR REF SOV: 088

OTHER: 451

DATE ACQ: 6 Jan 64

Card 3/3

YEREMENKO, V.N., otv. red.; FRANTSEVICH, I.N., red.; SAMSONOV, G.V., red.; PISARENKO, G.S., red.; FEDORCHENKO, I.M., red.; TRESVYATSKIY, S.G., red.; IVASHCHENKO, Yu.N., red.; POKROVSKAYA, Z.S., red.; RAKHLINA, N.P., tekhn. red.

[Surface phenomena in melts and in processes of powder metallurgy] Poverkhnostnye iavleniia v rasplavakh i protsessakh poroshkovoï metallurgii. Kiev, Izd-vo AN Ukr. SSR, 1963. 377 p. (MIRA 17:3)

1. Akademiya nauk URSR, Kiev. Instytut metalokeramiky i spetsial'nykh splaviv. 2. Institut metalokeramiki i spetsial'nykh splavov AN Ukr.SSR (for Yeremenko).

AID Nr. 983-4 5 June  
 PRODUCTION OF FERROMANGANESE METAL-POWDER COMPOSITIONS (USSR)

Frantsevich, I. N., and Ye. B. Boyko. Poroshkovaya metallurgiya, no. 2,  
 Mar-Apr 1963, 96-103. S/226/63/000/002/013/014

Several methods of obtaining sintered Fe-Mn alloys and powders with various manganese contents have been tested at the Institute of Powder Metallurgy and Special Alloys of the Ukrainian Academy of Sciences. The compacting of powders of iron and MP-1 manganese metal, electrolytic manganese (99.81% Mn, 0.08% C), or ferromanganese with 67.7 to 86.3% Mn and 0.3 to 6.2% C and subsequent sintering at 1100-1170°C for 8 hrs in a hydrogen atmosphere produced alloys with oxide inclusions which could not be eliminated by the use of very dry hydrogen, vacuum, or sintering prolonged to 24 hrs. Because of the oxides, subsequent impregnation of sintered articles proved to be difficult. The thermal diffusion method, i.e., the impregnation of green iron powder compacts with Mn at temperatures from 850 to 1050°C for 1 to 3 hrs in airtight containers packed with a mixture of ferromanganese (86.5% Mn), roasted aluminum oxide, and ammonium chloride (5% max) produced better results. It was found that impregnation with

Card 1/2



AID Nr. 933-4 5 June

## PRODUCTION OF FERROMANGANESE [Cont'd]

S/226/63/000/002/013/014

Mn proceeds rapidly in the first 1.5-2 hrs and is not intensified by either prolonging the exposure to 5 hrs or raising the temperature above 1050°C. No oxides were found in the impregnated layer. Alloys prepared by this method could be used for subsequent impregnation with other substances. The most satisfactory results were obtained by the diffusion saturation of loose Fe powder with Mn. In this method, alternate layers (3 to 15 mm thick) of loose iron and manganese powders were sintered at temperatures from 850 to 1050°C in a ceramic container. Powder flakes produced at 800-850°C are easily pulverized; those produced at or above 900°C cake and must be ground. This hardens the powder and impairs its ability to compact. Compacting of Fe-Mn powders is generally more difficult than Fe powders. Since the powder is hygroscopic and oxidizes with prolonged storage, it should be protected against moisture. [MS]

Card 2/2

L 11259-63 EWT(m)/BDS--AFFTC/ASN  
ACCESSION NR: AP3000596

8/0181/63/005/005/1238/1242

54  
52

AUTHOR: Frantsevich, I. N.; Kalinovich, D. F.; Kovenskiy, I. I.; Smolin, M. D.

TITLE: Relative and total transfer of substance in metals under the influence of direct current

SOURCE: Fizika tverdogo tela, v. 5, no. 5, 1963, 1238-1242

TOPIC TAGS: electrotransference, transference numbers, alloys, Ag, Zn

ABSTRACT: The total and fractional velocities of transference and the transference numbers were determined for Ag-Zn alloys. Measurements were made on alloys with 25, 35, and 50 atomic % zinc. Rods 1 mm in diameter and 70 mm long were used, the two with lowest zinc content being coated electrolytically with the radioisotope Ag sup 110 and the third being marked in the same manner with Zn sup 65. All samples were annealed to produce uniform distribution of the radioisotopes. The distribution of radioactivity was then measured along the length of the rods and was found to be uniform over the entire length. Direct current was then sent through the rods, which were placed in a neutral atmosphere (argon); the rods were simultaneously heated to 550C, and the experiment continued for 280 hours. The results show that in the first two alloys, belonging to the Alpha region, the velocity of electrotransference is greater for silver than for zinc. In the third sample (the

Card 1/2

L 11259-63  
ACCESSION NR: AP3000596

Beta region of solid solution) the relations are reversed. The author concludes that in using radioactive tracers to measure the electrotransference of the two components of a binary alloy, it is sufficient to use tracer atoms of but one of the components. Orig. art. has: 9 formulas, 1 figure, and 1 table. 2

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov, AN USSR, Kiev  
(Institute of Metal Ceramics and Special Alloys, Academy of Sciences UkrSSR)

SUBMITTED: 11Oct62

DATE ACQ: 11Jun63

ENCL: 00

SUB CODE: PH, ML

NO REF SOV: 001

OTHER: 002

Card

1b/wm  
2/2

L 18008-63

EWP(q)/EWT(m)/BDS AFFTC/ASD JD/JG

ACCESSION NR: AP3001298

S/0181/63/005/006/1728/1730

AUTHORS: Frantsevich, I. N.; Kalinovich, D. F.; Kovenskiy, I. I.; Smolin, M. D.

TITLE: Determining the degree of ionization of components in Mo-W alloy 59

SOURCE: Fizika tverdogo tela, v. 5, no. 6, 1963, 1728-1730 21 21 58

TOPIC TAGS: ionization, alloy, Mo, W, donor, acceptor, interaction, effective charge, radioactive isotope

ABSTRACT: The metal studied was Mo alloyed with 15 atomic % W. Thin wire samples, 0.5 mm in diameter and about 70 mm long, were prepared from this alloy, and in the middle part of each sample a thin layer of radioactive isotope ( $Mo^{99}$  or  $W^{185}$ ) was deposited. The length of this coated segment was about 3 mm. The method of determining rate of movement of the radioactive zone has been described previously by D. F. Kalinovich, I. I. Kovenskiy, and M. D. Smolin (FTT, 3, 3367, 1961). Investigations were made in the temperature ranges 1773-2473K for W and 1973-2573K for Mo at 100° intervals. At all temperatures the Mo ions migrated toward the anode, the W ions toward the cathode. The values for effective charges indicate that the predominant effect in transfer of W ions

Card 1/2

L 18008-63

ACCESSION NR: AP3001298

is hole movement, that of Mo ions, electron movement. The data show that a definite proportion of the electrons supplied to the collective fund by Mo atoms migrate to W atoms. These electrons apparently contribute to the partial build-up of an imperfect 5d band in the W atoms. Thus, a donor-acceptor interaction takes place in the alloy. Orig. art. has: 3 tables and 3 formulas.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR, Kiev  
(Institute of Powder Metallurgy and Special Alloys, Academy of Sciences,  
Ukrainian SSR)

SUBMITTED: 02Jan63

DATE ACQ: 01Jul63

ENCL: 00

SUB CODE: PH,ML

NO REF SOV: 004

OTHER: 000

Card 2/2

FRANTSEVICH, I.N., akademik

Powder metallurgy. Tekh. mol. 31 no.6:35 '63. (MIRA 16:7)

1. Akademiya nauk UkrSSR.  
(Powder metallurgy)

FRANTSEVICH, I.N., akademik

Conference on Powder Metallurgy. Vest. AN SSSR 33 no.12:78  
D '63. (MIRA 17:1)

1. AN UkrSSR.

FRANTSEVICH, I.N., akademik; LAVRENKO, V.A.

Recombination of hydrogen atoms on the surface of platinum. Dokl.  
AN SSSR 148 no.5:1137-1140 F '63. (MIRA 16:3)

1. Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR.
2. AN UkrSSR (for Frantsevich).  
(Hydrogen) (Platinum) (Surface chemistry)



LAVRENKO, V.A.; FRANTSEVICH, I.N., akademik

Elementary stages of the process of recombination of hydrogen atoms on an aluminum surface. Activation energy of the reaction. Dokl. AN SSSR 150 no.1:124-127 My '63. (MIRA 16:6)

1. Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR.
2. AN UkrSSR (for Frantsevich).  
(Hydrogen) (Aluminum catalysts) (Activation energy)

LAVRENKO, V.A.; FRANTSEVICH, I.N., akademik

Elementary stages of the recombination of hydrogen atoms on  
aluminum surface. Heat of adsorption of atoms. Dokl. AN SSSR  
150 no.3:592-595 My '63. (MIRA 16:6)

1. Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR.
2. AN UkrSSR (for Frantsevich).  
(Hydrogen) (Heat of adsorption)  
(Aluminum catalysts)

YEREMENKO, I.M., ed.; PAMILYCHENKO, I.I., ed.; SHCHERBA,  
G.V., ed.; IVASHCHENKO, G.S., ed.; POKROVCHENKO, I.I.,  
ed.; TRESVYATSKIY, S.G., ed.; I. A. IVASHCHENKO, Yu.I., ed.;  
POKROVSKAYA, Z.G., ed.

[Surface phenomena in metal and processes of powder metal-  
lurgy] Poverkhnostnye iavleniya v vysplavakh i protsessakh  
poroshkovoi metallurgii. 33 v, Izd-vo AN Ukr., 1982. 456 p.  
(MIRA 16:1)

1. Akademiya nauk Ukr., Kiev. Institut metallokeramiki i  
spetsial'nykh splavov. Institut metallokeramiki i spe-  
tsial'nykh splavov AN Ukr.SSR (for Ivashchenko, Yermenko)

AUTHOR: Frantsevich, I. N.; Voytovich, R. F.

TITLE: Oxidation of binary alloys

INSTRUMENT: AN SSSR. Institut fizicheskoy khimii. Mekhanizm vzaimodeystviya metallov  
Mechanism of interaction of metals and gases. Moscow, Izd-vo Nauka, 1964,  
135-142

alloy oxidation, binary alloy alloy, refractory alloy, oxidation kinetics,  
oxidation products, tungsten alloy, tungsten alloy

ABSTRACT: The article presents data obtained in a systematic study of the oxidation of a series of refractory alloys of the metals W, Ta, Nb, Ti, Zr, Fe, Co, Ni, and Cu at 500-900°C with concentrations of 5, 10, 30, 50, 70, 90, and 100 wt % of the second component. The alloys were prepared in an arc furnace and were subjected to isothermal annealing for 30 hrs. at 1200°C. The oxidation products were investigated by x-ray diffraction at 10-100°C.

Cord 1/2

2000-0-00  
ACCESSION NR: AT5009564

the chemically most probable products of the oxidation-reduction exchange reactions with the scale layer were performed. The three reactions were: (1) oxidation of tungsten, tantalum, niobium, and molybdenum to their respective oxides; (2) reduction of the oxides to the metal; and (3) the formation of the oxides from the metal. The results of these reactions are given in Table 1.

ASSOCIATION: None

SUBMITTED: 26Oct64

ENCL: 00

SUB CODE: MM

NO REF NOV: 000

OTHER: 00

Card 2/2

BR

ACCESSION NR: AT4045011

S/0000/64/000/000/0171/0176

AUTHOR: Frantsevich, I. N.; D. F., Kalinovich; I. I. Kovenskiy; M. D. Smolin

TITLE: Study of the passage of electricity through metallic solid solutions

SOURCE: Soveshchaniye po probleme Ispol'zovaniye atomnoy energii, Kiev, 1961. Radiatsionnaya avtomatika, izotopy\* i yaderny\*ye izlucheniya v nauke i tekhnike (Radiation automation control systems, isotopes, and nuclear radiation in science and technology); doklady\* soveshchaniya. Kiev, Izd-vo AN UkrSSR, 1964, 171-176

TOPIC TAGS: electroconductivity, solid solution, solid solution conductivity, metal solid solution, ion migration, electron density, electron vacancy, hole

ABSTRACT: The Institut metallokeramiki i spetsial'ny\*kh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys, AN Ukr.SSR) has worked out a method for studying the passage of electricity through solids by means of radioactive isotopes. This method makes it possible to study such passage not only in extrinsic elements but also in basic alloys. Some of the binary systems studied were: iron-carbon, nickel-chromium, cobalt-tungsten, nickel-tungsten, molybdenum-chromium, silver-palladium, etc. The radioactive isotopes used included carbon-14, iron-55, nickel-63, silver-110, etc. The experimental method has been discussed in an earlier paper by the same authors. According to

Card 1/3

ACCESSION NR: AT4045011

a recently-developed theory, ions during migration through solids carry the following effective charge:

$$Z^* = Z - n_- \sigma_- l_- - n_+ \sigma_+ l_+ \quad (1)$$

where  $z^*$  is the effective charge,  $Z$  is the true ion charge,  $n$  is the concentration of the conducting electrons (holes),  $\sigma$  is the electron (hole) scattering cross-section, and  $l$  is the length of the electron (hole) free path in the alloy. Values with a minus sign refer to electrons, those with a plus sign, to holes. For greater accuracy in determining the value of the effective charge, all the quantities needed in the calculations by the well-known Einstein formula were experimentally determined for each specimen. The first set of experiments served to obtain the relationship between  $Z^*$  and temperature; the next set was aimed at obtaining the electron density as a function of the charges of the basic alloy and the admixture and of the concentration of the latter; and the third set yielded the electron and hole cross-sections. The results of these experiments are tabulated, showing a linear inverse relationship between temperature and effective charge, and a direct linear relationship between electron density and both charge and concentration. Orig. art. has: 8 formulas and 3 tables.

ASSOCIATION: None

Card

2/3

ACCESSION NR: AT4045011

SUBMITTED: 07Jan64

ENCL: 00

SUB CODE: EM, SS

NR REF SOV: 004

OTHER: 001

Cord

3/3



FRANTSEVICH, I.N. [Frantsevykh, I.M.], akademik; KALINOVICH, D.F.  
[Kalynovych, D.F.]; KOVENSKIY, I.I. [Kovens'kyi, I.I.];  
SMOLIN, M.D.

Investigating the state of the atoms of molybdenum and  
tungsten in their binary alloys. Dop. AN URSSR no.8:  
1060-1063 '64. (MIRA 17:8)

1. Institut problem materialovedeniya AN UkrSSR.
2. AN UkrSSR (for Frantsevich).

FRANTSEVICH, I.N. [Frantsevykh, I.M.], akademik, KRAVETS, V.A. [Kravets', V.A.]

Studying distortions in crystals by the X-ray method. Dop. AN UkrSR  
no.7:906-910 '64. (MIRA 17:9)

1. Institut metallkeramiki i spetsial'nykh splavov AN UkrSR.
2. AN UkrSR (for Frantseovich).

AP40-1130  
AUTHOR: Prantsy\*ch, I. M. (Prantsevich, I. N.); Kaly\*noyy\*ch, D. P.  
(Kalinovich, D. F.); Kovens\*ky\*y, I. I. (Kovenskiy, I. I.);  
Smolin, M. D.

TITLE: Investigation of the state of molybdenum and tungsten atoms  
in their binary alloy

SOURCE: AN UkrRSR. Dopovid, no. 8, 1964, 1060-1063

TOPIC TAGS: binary alloy, molybdenum tungsten alloy, molybdenum atom  
electron transfer, tungsten atom electron transfer, molybdenum dif-  
fusion, tungsten diffusion

ABSTRACT: Electrical transfer and diffusion of both components of a  
binary Mo-20at%W alloy has been investigated in the 1400-2400C tem-  
perature range using radioactive Mo<sup>99</sup> and W<sup>185</sup> isotopes. It was  
found that at all temperatures, Mo ions migrated to the anode and W  
ions to the cathode. The absolute values computed for the effective  
charges show that the electrical transfer of W ions is effected pre-  
dominantly by the hole wind, and of Mo ions by the electron wind.

Card 1/2

L-11334-65

ACCESSION NR: AP4043730

The diffusion coefficient and the activation energy were  $1.9 \text{ cm}^2/\text{sec}$  and  $74,600 \text{ cal/mol}$  for W, and  $146 \text{ cm}^2/\text{sec}$  for Mo. The data obtained indicate transfer of a definite portion of the electrons from molybdenum atoms to tungsten atoms. These electrons are probably used for partial rebuilding of the defective d-shell of the W atoms. In this manner, the electron density redistribution between atoms of different kinds takes place in the alloy investigated, which leads to donor-acceptor interaction between the alloy components. Orig. art. has: 1 tables and 6 formulas.

ASSOCIATION: Institut problem materialoznavecva AN URSS (Institute of Problems of the Science of Materials, AN URSS)

03Jan64

ATD PRESS: 3106

ENCL: 00

NO REZ SOV: 006

OTHER: 001

Card 2/2

L 16910-65 EWT(m)/EWP(t)/EWP(b) AFWL JD

ACCESSION NR: AP5000939

S/0129/64/000/012/0046/0047

AUTHOR: Kalinovich, D. F.; Kovenskiy, I. I.; Smolin, M. D.;  
Frantsevich, I. N.

TITLE: Effect of direct current on steel carburization rate B

SOURCE: Metallovedeniyy i termicheskaya obrabotka metallov, no. 12,  
1964, 40-47

TOPIC TAGS: steel, steel 20, carburization, carbon diffusion, dif-  
fusion rate, direct current

ABSTRACT: Steel 20 wires 0.62 mm in diameter and 50 mm in length were carburized in a solid carburizer containing  $C^{14}$  radioactive isotope at 800, 900, 920, 940, and 960C for 2, 4, 6, and 8 hr. During carburization, direct current with a density of 18—22 amp/mm<sup>2</sup> was passed through the wire. Only the anode end of the wire (5 mm long) was in contact with the carburizing medium. It was found that the electric current accelerates the carbon diffusion. The accelerating effect increases with increasing temperature and duration of carburizing. The carbon diffusion rate is 1.8—2.5 times higher with the application of direct current than with conventional carburization.  
Card 1/2

L 16910-65

ACCESSION NR: AP5000939

Carbon was uniformly distributed across the whole section of the wire.  
Orig. art. has: 1 figure and 1 table.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN  
UkrSSR (Institute of Powder Metallurgy and Special Alloys, AN UkrSSR)

SUBMITTED: 00

ENCL: 00

SUB CODE: MM

NO REF SOV: 002

OTHER: 000

ATD PRESS: 3150

Card 2/2

LAVRENT'Y, V.A.; KHOROSHUN, L.P.; FRANTSEVICH, I.N., akademik

Thermodynamics of heterogeneous catalysis processes. Recombination of gas atoms on solid surfaces. Dokl. AN SSSR 159 no.4: 890-893 D '64 (MIRA 18:1)

1. Institut problem materialovedeniya AN UkrSSR i Institut mekhaniki AN UkrSSR. 2. AN UkrSSR ( for Frantsevich).

KHOROSHUN, L.P.; LAVRENKO, V.A.; KARAGYUR, K.E.; FRANTSEVICH, I.N.,  
akademik

Thermodynamics of heterogeneous catalysis; effect of microdis-  
tortions in the crystal lattice of a solid. Dokl. AN SSSR 159  
no.6:1391-1393 D '64 (MIRA 18:1)

1. Institut problem materialovedeniya AN UkrSSR i Institut  
mekhaniki AN UkrSSR. 2. AN UkrSSR (for Frantsevich).



L 25307-65 EWT(m)/EPF(c)/EPF(n)-2/T/EMP(t)/EMP(b) Pr-4/Pu-4 IJP(c) JD/JG

ACCESSION NR AP5005442

S/0293/65/003/001/0135/0141

41  
40  
B

AUTHOR: Lavrenko, V. A.; Frantsevich, I. H.

TITLE: Heterogeneous recombination of atomic gases. The interaction of atomic hydrogen with the surface of molybdenum

SOURCE: Kosmicheskiye issledovaniya, v. 3, no. 1, 1965, 135-141

TOPIC TAGS: heat transfer, reentry, aerodynamic heating, atom recombination, hydrogen, molybdenum

ABSTRACT: The recombination of neutral hydrogen atoms on the surface of molybdenum heated to 100—850C was studied at partial H pressures of 0.005—0.05 mm Hg. The heterogeneous recombination of atoms and radicals, formed in a bow shock wave, is important for determining the aerodynamic heating of the frontal part of spacecraft moving at hypersonic speeds, because the recombination rate is a determining factor for the overall heat flux, particularly at higher temperatures. Hydrogen is of interest because of its presence in the geocorona. The hydrogen atoms (10%) generated in a high-voltage discharge tube were passed to a 0.1-mm-diameter Mo wire, which was directly heated by a current. The coefficients of effective collisions were determined microcalorimetrically. Plots were obtained of the recombination rate

Card 1/2

L 25307-65

ACCESSION NR: AP5005442

vs temperature, the coefficients of recombination vs temperature, the transmission coefficients vs pressure, and the heats of chemisorption. It was concluded that heterogeneous recombination is a complex phenomenon and that the chemisorption/on active catalyst sites, the diffusion of atoms through the frozen surface layer, and the conditions of steady-state heat transfer should be further studied. orig. art. has: 1 figures and 6 formulas. [PV]

ASSOCIATION: none

SUBMITTED: 17Nov63

ENCL: 00

SUB CODE: ME,SV

NO REF SOV: 002

OTHER: 010

ATD PRESS: 3184

MAKAROVA, R. V.; PILYANKEVICH, A. N.; FEDOROVICH, O. K.; PRANTSEVICH, I. N.

"Vorgange beim sintern mit flüssiger phase in den systemen W-Ni-Fe und W-Ni-Cu."

report submitted for 3rd Intl Conf on Powder Metallurgy, Eisenach, E. Germany,  
13-15 May 1965.

Kiev, UkSSR.

ACCESSION NR. AP5018273

AUTHOR: Makarova, R. V.; Teodorovich, O. K.; Frantsevich, I. N.

TITLE: Coalescence during liquid phase sintering of tungsten-nickel-iron and tungsten-nickel-copper systems

SOURCE: Poroshkovaya metallurgiya, no. 7, 1965, 45-52

TOPIC TAGS: tungsten alloy, nickel alloy, iron alloy, copper alloy, sintered alloy, liquid phase sintering

ABSTRACT: A description is given of metallographic and electron-microscopic studies of the coalescence of particles during the production of W-Ni-Fe and W-Ni-Cu alloys. Results show that the growth of the grains during the alloy formation proceeds dissolution and precipitation and by the coalescence of pairs and groups of tungsten grains. According to this, the sintering process speed, controlled by the rate of surface diffusion of the atoms, should be commensurable with the rate of growth of particles as a result of the transfer of matter through the liquid phase. However, the role of the sintering process in the particle growth depends also on the actual sintered system, particularly on the composition of the easily melting component and, consequently, on the melting temperature, the solubility of the solid phase within the liquid phase (degree of supersaturation), and the contact-wetting

Card 1/3

L 61072-65

ACCESSION NR: AP5018273

angle. Obviously, the coalescence process changes the mean arithmetic value of the particle radius of the system and may thus alter the particle growth relationships proposed earlier by G. W. Greenwood (Acta. Met., 4(3), 243, 1956). It is therefore felt that the growth of particles, particularly under the conditions of equilibrium compositions of the liquid phase components of the system, should be further carefully studied. Orig. art. has: 2 formulas, 8 figures, and 1 table.

ASSOCIATION: Institut problem materialovedeniya AN UkrSSR (Institute for the Problems of Materials Science, AN UkrSSR)

SUBMITTED: 09Nov64

ENCL: 00

SUB CODE: MM

NO REF SOV: 003

OTHER: 006

Card

*ke*  
2/2

L 1679-66 ENP(e)/ENT(m)/T/ENP(t)/ENP(k)/ENP(z)/ENP(b)/EWA(c) IJP(c) JD/HW/JG

ACCESSION NR: AP5020772

UR/0226/65/000/008/0062/0069

AUTHOR: Dzykovich, I. Ya.; Makarova, R. V.; Teodorovich, O. K.;  
Frantsevich, I. N.

TITLE: Distribution of elements in forming metal ceramic alloys of the tungsten-nickel-iron system

SOURCE: Poroshkovaya metallurgiya, no. 8, 1965, 62-69

TOPIC TAGS: metal ceramic material, tungsten base alloy, nickel containing alloy, iron containing alloy, solubility

ABSTRACT: Samples of tungsten-nickel-iron alloys of the following composition were studied: W-10Ni(nickel 9.8%, remainder tungsten); W-7Ni-3Fe (7.2% nickel, 2.95% iron, remainder tungsten), W-5Ni-5Fe (5.0% nickel, 5.15% iron, remainder tungsten), and W-3Ni-7Fe (3.0% nickel, 7.0% iron, remainder tungsten). Powders were prepared from reduced tungsten powder with a grain size of less than 40 microns and an aqueous solution of the nitrogen salts of nickel and iron and were reduced in a hydrogen atmosphere at 450 and 850 C. They were pressed at 20 kn/cm<sup>2</sup> into samples with a diameter of 10 mm and a height of 10 mm and  
Card 1/2

L 1679-66

ACCESSION NR: AP5020772

sintered in a furnace at 1450 C for 2 hours, with rapid cooling. One face of each sample was polished for examination. Results of experiments show that, in tungsten-nickel iron alloys, the introduction of iron has an effect on the mutual solubility of tungsten and nickel. In alloys containing iron, in comparison with tungsten nickel alloys, there is observed a contraction of the heterodiffusion front. The distribution of iron with respect to the tungsten grain remains constant, independent of the composition of the alloy, and more uniform in spite of the solubility which is five times greater than the solubility of nickel in alloys with an identical ratio of elements. Orig. art. has: 4 figures and 2 tables

ASSOCIATION: Institut elektrosvariki im. E. O. Patona AN USSR (Electric Welding Institute, AN UkrSSR) Institut problem materialovedeniya AN USSR (Institute for Problems of Materials Processing, AN UkrSSR)

SUBMITTED: 06Oct64

ENCL: 00

SUB CODE: MM

NR REF SOV: 003

OTHER: 000

Card 2/2

ACC NR: AP6025941 SOURCE CODE: UR/0226/66/000/007/0073/0075

AUTHOR: Frantsevich, I. N.; Lyashchenko, A. B.

ORG: Institute for Problems in the Science of Materials AN UkrSSR (Institut problem materialovedeniya AN USSR)

TITLE: Young's modulus of carbides of some transition metals

SOURCE: Poroshkovaya metallurgiya, no. 7, 1966, 73-75

TOPIC TAGS: Young modulus, carbide, transition metal

ABSTRACT: The article gives the values of Young's modulus of carbides of titanium, vanadium, chromium, zirconium, niobium, molybdenum, and tungsten obtained on samples with a composition similar to that of the stoichiometric. The values of Young's modulus are determined for the compact state. It was found that Young's modulus of carbides depends on the quality of s + d electrons in the metal atom in carbides of the Ti, V, Cr, and Zr, Nb, Mo series. It is assumed

Card 1/2



45329-06

ACC NR: AP6025941

27 /  
that a similar dependence will take place in carbides of the W, Ta, Hf series,  
permitting the estimate of the Young modulus of tantalum and hafnium carbides.  
Orig. art. has: 2 figures and 2 tables. [Based on authors' abstract.] [KS]

SUB CODE: 11, 20/ SUBM DATE: 26Sep65/ ORIG REF: 007/

Card 2/2 LC

DZYKOVICH, I.Ya.; MAKAROVA, R.V.; TEODOROVICH, O.K.; FRANTSEVICH, I.N.

Distribution of elements during the formation of ceramic metal  
alloys in the system W - Ni - Fe. Porosh. met. 5 no.8:62-69  
Ag '65. (MIRA 18:9)

1. Institut elektrosvarki imeni Patona AN UkrSSR i Institut  
problem materialovedeniya AN UkrSSR.

MATVEYEV, V.A.; FILIMONTSEV, D.P.; RADOMYSEL'SKIY, I.D.; FRANTSEVICH, I.N.

Industrial unit for the reduction of scale by a combined  
method. Porosh. mat. 4 no.6:89-95 N-D '64. (MIRA 18:3)

1. Yuvenergometallurgprom i Institut problem materialovedeniya  
AN UkrSSR.

KALINOVICH, D.F.; KOVENSKIY, I.I.; SMOLIN, M.D.; FRANTSEVICH, I.N.

Effect of a direct current on the carburization rate of steel.  
Metalloved. i term. obr. met. no.12:46-47 D '64 (MIRA 18:2)

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